Name: _____ **Industrial Maintenance**

Directions:
Evaluate the student by checking the appropriate number to indicate the degree of competency. The rating for each task should reflect employability readiness rather than the grades given in class.

Rating Scale (0-6):

- **0 No Exposure** – no experience/knowledge in this area; program/course did not provide instruction in this area
- **1 Unsuccessful Attempt** – unable to meet knowledge or performance criteria and/or required significant assistance
- **2 Partial Demonstration** – met some of the knowledge or performance criteria with or without minor assistance
- **3 Knowledge Demonstrated** – met knowledge criteria without assistance at least once
- **4 Performance Demonstrated** – met performance criteria without assistance at least once
- **5 Repetitive Demonstration** – met performance and/or knowledge criteria without assistance on multiple occasions
- **6 Mastered** – successfully applied knowledge or skills in this area to solve related problems independently

(C) – Indicates the core competencies.

0	1	2	3	4	5	6	**A. Appreciate and apply all personal and workplace safety procedures**	**Notes:**
							1. Read, interpret, and locate regulations **(C)**	
							2. Identify colors and symbols used in safety identification (i.e. hazardous materials) **(C)**	
							3. Maintain the shop and/or lab, and in a safe condition (i.e. clean and close-down) **(C)**	
							4. Demonstrate first aid (i.e. CPR and First Responders) **(C)**	
							5. Identify the safety regulations for various work environments **(C)**	
							6. Select the proper clothing and safety equipment for various jobs (i.e. personal protective equipment [PPE]) **(C)**	
							7. Determine potential hazards and provide for safety (i.e. exits, fire extinguishers, telephone, and power disconnect) **(C)**	
							8. Discuss the impact of safety (i.e. cost, physical, and long-term effects)	
							Other:	

0	1	2	3	4	5	6	**B. Use hand and power tools/equipment consistent with industry and safety standards**	**Notes:**
							1. Correctly/safely use hand tools **(C)**	
							2. Correctly/safely use power hand tools **(C)**	
							3. Correctly/safely use guards on power shop tools **(C)**	
							4. Correctly/safely use floor standing lab equipment (i.e. drill press and band saw) **(C)**	
							Other:	

0	1	2	3	4	5	6	**C. Apply mathematical skills to industrial maintenance problems**	**Notes:**
							1. Complete basic math problems (i.e. add, subtract, multiply, and divide) **(C)**	
							2. Read instruments that involve the metric system of units and solve occupationally specific problems	

							3. Use scientific notation and prefixes (i.e. mega, mil, and micro) **(C)**	
							4. Convert between values recorded as fractions, decimals, and percents using calculators and/or computer software **(C)**	
							5. Solve work related problems involving basic math operations using whole numbers, fractions, and decimals **(C)**	
							Other:	

0	1	2	3	4	5	6	**D. Demonstrate basic computer and electronic search skills**	**Notes:**
							1. Comprehend a computer operating system **(C)**	
							2. Demonstrate keyboarding skills **(C)**	
							3. Use word processing, spreadsheet, and database software	
							4. Use e-mail and e-mail software	
							5. Use the Internet and other online information sources	
							Other:	

0	1	2	3	4	5	6	**E. Generate maintenance records for documentation purposes**	**Notes:**
							1. Describe the importance of record keeping (i.e. quality standards) **(C)**	
							2. Generate maintenance records (i.e. asset history, work orders, reports, and preventative maintenance [PMI])	
							Other:	

0	1	2	3	4	5	6	**F. Identify, maintain, and troubleshoot industrial mechanical systems consistent with industry and safety standards.**	**Notes:**
							1. Follow safety practices (i.e. rigging, lock-out, tag-out, [stored energy], pinch points, rotating machinery, chemical hazards, and excessive heat) **(C)**	
							2. Identify the laws of motion and force (i.e. horse power, torque, direction, and rpm) **(C)**	
							3. Read assembly-type blueprints (i.e. equipment manual information, exploded view [detail and enlarged] serial numbers, and parts list) **(C)**	
							4. Use special-purpose hand and power tools (i.e. pullers, presses, dial indications, torque wrench, and tachometer) **(C)**	
							5. Describe ways to transmit power (i.e. mechanical belts and chains) **(C)**	
							6. Describe components of power systems (i.e. bearings, shafts, housing, power source, keyways, and belts) **(C)**	
							7. Calculate ratios and proportions **(C)**	

							8. Perform mechanical alignments (i.e. belts, chains, couplings, shafts, pulleys, housings, balancing, bearings, gauging, adjustments, alignment, loading, tensioning, dimensioning, and tolerancing) **(C)**	
							9. Identify the use and application of lubricants (i.e. drip, pressure)	
							10. Perform basic problem-solving techniques (i.e. alignment, wear, heat, vibration, friction, noise, fatigue, and environmental conditions) **(C)**	
							11. Identify the PM needs of equipment and tools	
							Other:	

0	1	2	3	4	5	6	**G. Identify, maintain, and troubleshoot electrical systems consistent with industry (NEC) and safety standards**	**Notes:**
							1. Follow safety practices (i.e. lock-out, tag-out, tool maintenance, safe live work practice [OSHA, NEC], and local codes) **(C)**	
							2. Complete problems based on electrical laws (i.e. Ohm's law, Kirchoff's law, watts, series circuits, and parallel circuits) **(C)**	
							3. Comprehend electrical theories and laws	
							4. Identify symbols used in electrical drawings **(C)**	
							5. Draw wiring diagrams (i.e. pictorial, schematic, and ladder) **(C)**	
							6. Identify circuit protection devices (i.e. breakers, fuses, and circuit overloads) **(C)**	
							7. Correctly/safely use meters and measurement devices (i.e. multimeters and oscilloscopes) **(C)**	
							8. Identify transformers and their voltages **(C)**	
							9. Describe electrical motors (i.e. single-phase, three-phase, centrifugal, and squirrel cage) **(C)**	
							10. Install electrical devices and components **(C)**	
							11. Identify variable drive motors (i.e. DC, AC, frequency, and servos) **(C)**	
							12. Install, program, and troubleshoot drive motors	
							13. Distinguish between wye and delta power (i.e. three-phase)	
							14. Perform proper circuit wiring (i.e. identification, marketing, and labeling) **(C)**	
							15. Perform basic single-phase wiring **(C)**	
							16. Perform basic three-phase wiring (i.e. 208, 240, and 460) **(C)**	
							17. Build control circuits	
							18. Perform logical steps of troubleshooting on control circuits **(C)**	
							19. Identify PM	
							Other:	

0	1	2	3	4	5	6	**H. Identify, maintain, and troubleshoot industrial electronic systems consistent with industry and safety standards**	**Notes:**
							1. Follow safety practices (i.e. lock-out, tag-out, tool maintenance, safe live work practices [OSHA, NEC, local codes], and robotic working envelope) **(C)**	
							2. Calculate electrical laws (Ohm's law, Kirchoff's law, watts, series circuits, parallel circuits, impendence, capacitance, inductance, and magnetism) **(C)**	
							3. Identify symbols used in electronics **(C)**	
							4. Draw wiring diagrams (i.e. pictorial, schematic, and ladder) **(C)**	
							5. Describe electronic components, their relationships, and uses **(C)**	
							6. Identify electronic connectors (i.e. nine-pin, RS-232, data collection, and data transmission)	
							7. Use electronic measuring devices (i.e. frequency operators)	
							8. Describe the difference between analog and digital signals **(C)**	
							9. Convert number systems and codes for binary, hexadecimal, octal, and BCD	
							10. Interpret the six parts of logic (i.e. AND, OR, NOR, NAND, memory, and truth tables)	
							11. Describe the use of different programmable logic controller (PLC) components (i.e. racks, input-output, CPU, battery backup, ETROM, programmer, communication cables, and connectors)	
							12. Perform basic PLC programming (C)	
							13. Perform basic PLC control wiring **(C)**	
							14. Perform basic PLC troubleshooting **(C)**	
							15. Describe different computerized numerical control (CNC) components (i.e. input-output, CPU, post processor, and connection hardware)	
							16. Describe the basic components of robotic systems	
							17. Demonstrate basic electronic connection techniques (i.e. soldering, crimping, and cable repair) **(C)**	
							18. Perform logical steps of troubleshooting on electronic systems **(C)**	
							19. Identify the use of process control systems **(C)**	
							20. Install process control systems (i.e. sensors, controllers, and photo eye) **(C)**	
							21. Perform logical steps of troubleshooting for process control systems **(C)**	
							22. Identify PM	
							Other:	

0	1	2	3	4	5	6	**I. Identify, maintain, and troubleshoot fluid power systems consistent with industry and safety standards**	**Notes:**
							1. Follow safety practices (i.e. lock-out, tag-out, stored energy, chemical hazards, high pressure, and proper coupling techniques) **(C)**	
							2. Identify fluids and contamination control techniques **(C)**	
							3. Calculate elementary force, power, speed, and pressure (i.e. Pascal's law) **(C)**	
							4. Describe hydraulic components (i.e. pumps, reservoirs, actuators, and control valves) **(C)**	
							5. Demonstrate the use of hydraulic components (i.e. pumps, actuators, and control valves) **(C)**	
							6. Describe pneumatic components (i.e. compressors and dryers) **(C)**	
							7. Demonstrate the use of pneumatic components (i.e. compressors and dryers) **(C)**	
							8. Describe vacuum components (i.e. actuators and reservoirs) **(C)**	
							9. Demonstrate the use of vacuum components (i.e. actuators and reservoirs) **(C)**	
							10. Draw fluid power schematic symbols	
							11. Use special-purpose tools (i.e. benders, crimpers, flare-nut, wrenches, tube cutters, reamers, and pipe threaders) **(C)**	
							12. Install connectors, piping, and tubing in a hydraulic system **(C)**	
							13. Install connectors, piping, and tubing in a pneumatic system **(C)**	
							14. Perform the logical steps of troubleshooting for a fluid power system **(C)**	
							15. Identify PM	
							Other:	

0	1	2	3	4	5	6	**J. Perform general maintenance tasks consistent with industry and safety standards**	**Notes:**
							Layout, prepare, and fabricate industrial components 1. Follow safety practices (i.e. rigging, lock-out, tag-out, pinch points, rotating machinery, chemical hazards, excessive heat, and open flame protection) **(C)**	
							2. Use fabrication and repair tools **(C)**	
							3. Demonstrate basic fabrication layout techniques as per print or diagram (i.e. wood, metal, and plastic) **(C)**	
							4. Perform joint preparation for all types of materials (i.e. swaging, reaming, and chamfering) **(C)**	
							Perform basic plumbing techniques consistent with industry and safety standards 5. Demonstrate proper plumbing safety procedures **(C)**	
							6. Cut, clean, and glue plastic pipe **(C)**	

							7. Cut, clean, and solder copper pipe (i.e. cast iron pipe and gas) **(C)**	
							8. Cut and thread pipe **(C)**	
							9. Form a flare **(C)**	
							10. Assemble a compression fitting **(C)**	
							11. Rough-in plumbing fixtures	
							12. Service and/or replace plumbing fixtures (i.e. stool and urinal tub)	
							13. Install, service, and/or replace plumbing accessories	
							14. Locate and repair leaks in pipes and lines **(C)**	
							15. Clean traps, drains, and vents **(C)**	
							16. Describe backflow prevention **(C)**	
							17. Service a water heater **(C)**	
							Perform basic machining tasks consistent with industry and safety standards 18. Demonstrate basic tool maintenance (i.e. grinding and sharpening) **(C)**	
							19. Perform drilling operations using a tap chart, drill chart, and formulas **(C)**	
							20. Calculate feeds and speeds	
							21. Perform basic lathe operations	
							22. Perform basic mill operations	
							Perform basic welding tasks consistent with industry and safety standards 23. Describe basic oxyfuel welding and cutting uses **(C)**	
							24. Cut a plate using oxyfuel **(C)**	
							25. Solder and braze using oxyfuel **(C)**	
							26. Describe basic shielded metal arc welding (SMAW) uses	
							27. Setup a SMAW machine	
							28. Prepare material for SMAW	
							29. Select electrode or filler for SMAW	
							30. Construct a fillet weld using SMAW	
							31. Construct a groove weld using SMAW	
							32. Describe basic gas metal arc welding (GMAW) uses	
							33. Setup GMAW machine	
							34. Prepare material for GMAW	

							35. Select electrode or filler for GMAW	
							36. Construct a fillet weld using GMAW	
							37. Construct a groove weld using GMAW	
							38. Use destructive or nondestructive testing to check for fillet weld penetration	
							39. Demonstrate the proper use of a plasma cutter	
							40. Identify PM	
							Other:	

0	1	2	3	4	5	6	**K. Perform basic heating, ventilation and air conditioning (HVAC) maintenance tasks consistent with industry and safety standards**	**Notes:**
							1. Follow safety practices (i.e. lock-out, tag-out, and refrigerant handling) **(C)**	
							2. Describe water treatment requirements	
							3. Describe cooling tower maintenance procedures	
							4. Describe refrigeration principles	
							5. Describe sealed system components (i.e. plumbing and fittings)	
							6. Test temperatures	
							7. Interpret schematic symbols	
							8. Interpret a psychometric chart	
							9. Solve psychometric problems	
							10. Measure air qualities (i.e. dry bulb, wet bulb, and CFM)	
							11. Use HVAC tools and instruments	
							12. Maintain air filtration systems	
							13. Service and/or replace the electronic air cleaner	
							14. Start and adjust a furnace	
							15. Check the airflow	
							16. Adjust the airflow	
							17. Perform systematic problem solving of an air supply system	
							18. Perform systematic problem solving of a fuel system	
							19. Maintain construction and repair	
							20. Perform PM	
							Other:	

0	1	2	3	4	5	6	**L. Install, service, and troubleshoot basic commercial refrigeration systems consistent with industry and safety standards**	**Notes:**
							1. Comply with the Environmental Protection Agency (EPA) refrigeration standards **(C)**	
							2. Describe sealed-system accessories	
							3. Leak-test and evacuate the system	
							4. Resolve low- and high-suction discharge pressure problems	
							5. Pump down the unit	
							6. Test the compressor efficiency	
							7. Install, service, and/or replace the compressor	
							8. Install and replace the condensing unit	
							9. Install, service, and/or replace the stem-type valve	
							10. Install, test, and replace the control valves	
							11. Service and/or replace the condenser	
							12. Service and/or replace the evaporator	
							13. Replace the drier cartridge	
							14. Service and/or replace the metering device	
							15. Adjust the metering device	
							16. Replace the defrost system components	
							17. Replace the heaters	
							18. Cleanup a contaminated system	
							19. Charge the refrigeration system	
							20. Perform systematic problem solving of an electrical system	
							21. Perform systematic problem solving of a refrigerant system	
							Other:	

0	1	2	3	4	5	6	**M. Demonstrate leadership skills in the classroom, industry, and society ****	**Notes:**
							1. Demonstrate an understanding of SkillsUSA-VICA, its structure, and activities	
							2. Demonstrate an understanding of one's personal values	
							3. Perform tasks related to effective personal management skills	
							4. Demonstrate interpersonal skills	
							5. Demonstrate etiquette and courtesy	

							6. Demonstrate effectiveness in oral and written communication	
							7. Develop and maintain a code of professional ethics	
							8. Maintain a good professional appearance	
							9. Perform basic tasks related to securing and terminating employees	
							10. Perform basic parliamentary procedures in a group meeting	
							Other:	

****NOTE: These competencies are addressed in the Missouri SkillsUSA-VICA Curriculum Guide lessons***